



Original Article

Oral Cancer Screening in Elderly in Sao Paulo State, Brazil (2001 to 2009)

Fernanda Campos de Almeida Carrer¹, Edgard Michel Cossato¹, Claudia Cazal², Gilberto Alfredo Pucca Júnior³, Dorival Pedroso da Silva⁴, Maria Ercilia de Araújo¹

¹Professor, Department of Social Dentistry, School of Dentistry, University of Sao Paulo, São Paulo, SP, Brazil.

²Professor, Department of Pathology, Federal University of Pernambuco, Recife, PE, Brazil.

³Professor, Department of Dentistry, University of Brasilia, Brasilia, DF, Brazil.

⁴Professor, Department of Maxillo Facial Surgery Prosthesis and Traumatology, School of Dentistry, University of Sao Paulo, São Paulo, SP, Brazil.

Author to whom correspondence should be addressed: Fernanda Campos de Almeida Carrer, Departamento de Odontologia Social – Faculdade de Odontologia - Universidade de São Paulo. Av. Lineu Prestes, 2227- Cidade Universitária. São Paulo, SP, Brasil. 05508-000. Phone: 55 11 3091 7872 E-mail: fernandacsa@usp.br.

Academic Editors: Alessandro Leite Cavalcanti and Wilton Wilney Nascimento Padilha

Received: 31 August 2016 / Accepted: 03 August 2017 / Published: 22 August 2017

Abstract

Objective: To describe and explore analytically the trends of oral cancer positive cases incidence during nine-year screenings campaign of Sao Paulo's State (Brazil) and to show other countries and health services an option for tracking at-risk population.

Material and Methods: Secondary official data were tabulated and analysed using the Excel and STATA statistical 10.0 software packages. After descriptive statistics, the trend curves were calculated by moving average for each variable (type moving average of two samples centred) to attenuate the random variability of the series, and trends classified: stable, ascending and descending. **Results:** The trend of municipalities numbers remained stable; the number of examined people, the screening coverage and the absolute number of patients referred to secondary health care showed an increasing trend; and the percentage of suspected cases showed a decreasing trend during the nine-year period. A decrease in the number of suspicious lesions and confirmed cases of oral cancer among the volunteers was observed, and the reorganization of secondary and tertiary levels of oral care helped to modify these numbers. **Conclusion:** We believe this experience was more important to help health services organization than for the oral cancer diagnosis itself, and it might be used to inspire other countries and oral health services.

Keywords: Mouth Neoplasms; Public Policy; Early Diagnosis; Health Promotion.

Introduction

In Brazil, the elderly population (over 60 years old) has been invited to go to basic health units (primary care level) to receive free influenza immunization, since 2000. In 2001, the Health Department of Sao Paulo's State began coordinating a screening for oral cancer through visual inspection of the oral cavity, which occurs simultaneously with the immunization of the elderly [1]. In India, oral cancer screenings have already demonstrated reduction in the mortality rate among high-risk oral cancer individuals [2], however the U.S. Preventive Services Task Force Recommendation Statement concluded that the current evidence is insufficient to assess the balance of benefits and harms of screening for oral cancer in asymptomatic adults [3]. Some researchers alerted to the low resoluteness [4], between the years 2001-2004, of Brazilian campaign experience focusing on the enormous limitation to refer patients for biopsy procedure and subsequent treatment of positive oral cancer cases. However, only in 2004, secondary networks of attention called Centers of Dental Specialties (CEOs) and tertiary networks known as Centers of High Complexity in Cancer (CACON)[5-7] began to be organized in Brazil.

Recently, a literature review provoked the reader to reflect and ask: is early diagnosis of oral cancer a feasible objective? Who should be blamed for diagnostic delay [8]? Therefore, the invitation that we would like to extend to all health professionals is to continue discussing this and other crucial questions so that local health projects can be adjusted to the oral cancer early detection, decreasing death or facial mutilations due surgical procedures currently available for cancer treatment.

Thus, the goal of this study is to demonstrate an option for tracking oral cancer risk population by describing and exploring analytically the trends and variables related to an nine-year oral cancer screening experience in Sao Paulo, Brazil. The number of participating municipalities, amount and coverage of examined patients, reference to the secondary level care, percentage of suspicious cases, and analysis of the incidence of positive cases of oral cancer through this period were described.

Material and Methods

Secondary data, from State Government of Sao Paulo, published between 2001 and 2009, were tabulated and analyzed using Excel 2003 (Microsoft Corporation, Los Angeles, USA) and STATA statistical 10.0 (Stata Corp LP, College Station, USA,). The variables were: number of cities that have adopted the campaign during the immunization program, number of examined persons, amounts of suspected oral cancer lesions and the number of confirmed cases of oral cancer. Descriptive statistics were initially performed, and trends were calculated by moving the average for each variable (type moving average of two centred samples) to attenuate the random variability of the series [9]. The estimation of trends followed the methodological guidelines presented previously [10]. The estimation of annual growth or decline of each variable was performed by Prais-Winsten procedure [11], a generalized linear regression to make correct first-order autocorrelation in the

analysis of sets of values organized overtime. To control the effectiveness of using this methodological approach, we used the Durbin-Watson statistic to measure the existence of first-order autocorrelation of the series consisting of the annual rates; also, to check whether the correction was compatible with the hypothesis of residual regression with random distribution [10-12].

This procedure allowed the authors to classify the types of trends, interpreting themes increasing, decreasing or stable. The significance level was 5%.

It was not possible to apply the statistical test described above to the confirmed cases of oral cancer, because they were only available from 2005 to 2010. For this variable, therefore, we used Fisher's exact test to evaluate the incidence of the disease during the period.

Results

Table 1 shows data from oral mucosal screening, while Table 2 describes the moving averages used for tests of trend analysis.

Table 1. Descriptive data of the oral cancer screening of the State of Sao Paulo.

	Number of cities	Number of people examined	Coverage of screening	Patients referred to secondary health care	% suspects	Confirmed cases	Rate confirmed by 100.000
2001	334	90886	4.06	25175	28	-	-
2002	434	142774	6.39	13801	10	-	-
2003	512	226540	8.80	18059	8	-	-
2004	490	238087	8.73	20270	9	-	-
2005	317	253648	10.87	22939	9	53	20.9
2006	509	360760	12.00	30481	8	72	19.96
2007	503	435971	15.00	34346	8	54	12.39
2008	539	480607	16.00	24280	5	52	10.82
2009	548	629613	18.50	28401	5	70	11.12

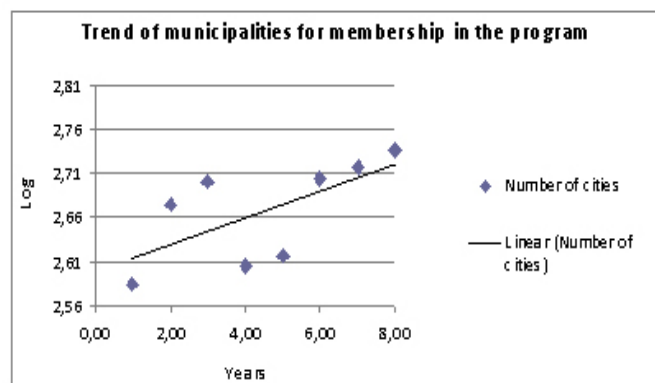
Table 2. Moving average of data describing oral cancer screening of the State of Sao Paulo.

	Number of cities	Number of people examined	Coverage of screening	Patients referred to secondary health care	% suspects	Confirmed cases	Rate confirmed by 100.000
2001	384.00	116830	5.23	19488	19	-	-
2002	473.00	184657	7.60	15930	9	-	-
2003	501.00	232314	8.77	19165	8	-	-
2004	403.50	245868	9.80	21605	9	-	-
2005	413.00	307204	11.44	26710	9	62.50	20.43
2006	506.00	398366	13.50	32414	8	63.00	16.18
2007	521.00	458289	15.50	29313	6	53.00	11.61
2008	543.50	555110	17.25	26341	5	61.00	10.97

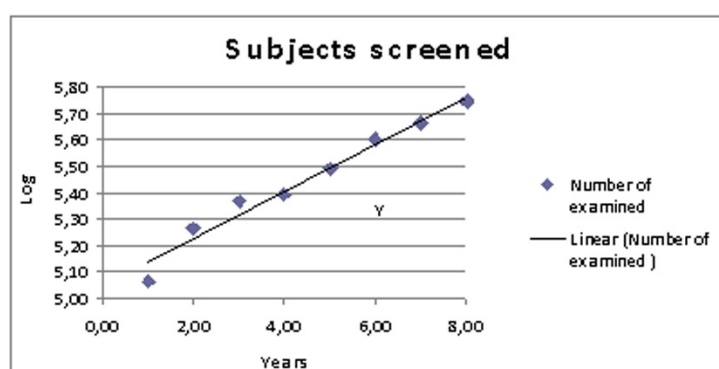
Table 3 describes and summarizes all data analyzed and trends observed for each of the variables. When the trend of municipalities participating in the program was analyzed, it appeared to be stable as shown in Table 3 and Figure 1.

Table 3. Trends analysis of descriptive data of the oral cancer screening.

Variables	Trend	SE	CI(95%)		p	Classification
Number of cities	0.368	0.007	0.028	0.720	0.080	Stable
Number of people examined	2.260	0.005	1.972	2.556	0.000	Ascending
Coverage of screening	1.708	0.004	1.487	1.934	0.000	Ascending
Patients referred to secondary health care	0.789	0.011	0.239	1.370	0.020	Ascending
% suspects	-1.230	0.014	-1.796	-0.625	0.000	Descending

**Figure 1. Trend of municipalities for membership in the program.**

The oral screening coverage rate number, when examined by the ratio of influenza immunization, rose from 4.1% in 2001 to 18.5% in 2009. A total of 629,613 subjects were screened in 2009. Table 3 and Figure 2 show the increasing trend of this variable. The number of examined patients followed the trend of the coverage increasing during the analyzed period (Table 3 and Figure 3).

**Figure 2. Trend of number of subjects screened per year.**

Regarding the number of soft tissue lesions, 7.8% of those examined in 2001 needed to be re-examined by experts at the Center of Dental Specialties (CEOs). The highest numbers of diagnosed lesions occurred in 2002 with 9.7% from those examined volunteers; and, since 2005 there has been a gradual decrease in these numbers. In 2009 it was noticed the lowest percentage of soft tissue lesions (5% of the elderly). The analysis had shown a decreasing trend for this variable (Table 3 and Figure 4).

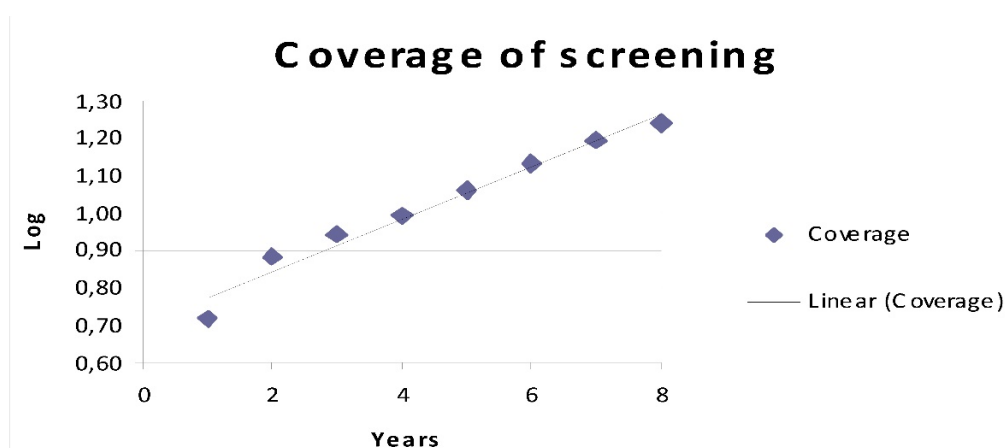


Figure 3. Trend of coverage of screening.

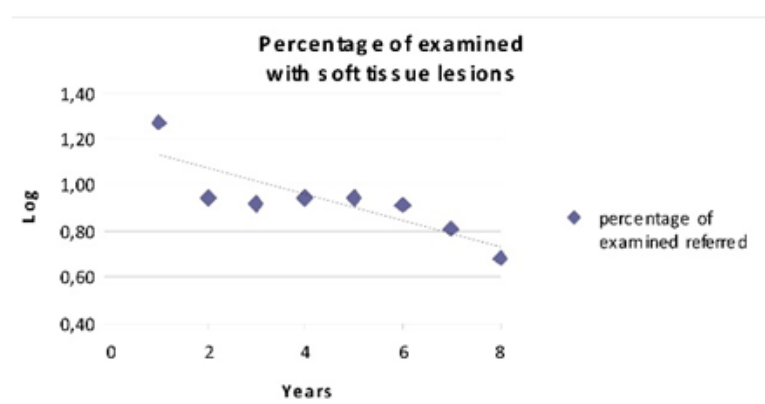


Figure 4. Trend of percentage of examined with soft tissue lesions referred to second level of care.

Discussion

Sao Paulo is an important Brazilian state, with 645 cities in an area of 248,209.23 km². It was certainly a great challenge to include a state wide screening action for oral cancer into a federal action, such as influenza immunization of the elderly. The influenza vaccine was initially offered to Brazilian citizens over 65 years old in the late 90th's and, since 2000, the age limit has been reduced to 60 years old [13].

Some authors, pointing out the period from 2001 to 2004, found positive aspects of oral cancer campaign considering the screenings to be performed only by simply visual examination of the mouth, without additional costs [4]. Also, the number of dentists employed by the public service at the primary level care in Sao Paulo's State would be compatible with the expansion of this program, and it could represent an operational mechanism for its implementation, since the relatively short period (2 weeks) of vaccination campaigns. The authors add that activities such as health education, evaluation of dentures, diagnosis and treatment of oral soft tissues lesions, which are inherent to the dentist, could justify the integration of this kind of professional into the vaccination campaigns. Further, the annual period in which these campaigns and screenings are carried out

provides a unique opportunity to interact with a stratum of the population, which has less access to other health promotion initiatives [4].

Despite the positive points that the trend presented in 2007, the same authors observed a non-resolution of the program and suggested that, if there was no institutional commitment to solve specific problems (training and motivation of the dentists involved in the program, clear definition of an effective referral system to meet demand, and organization of an efficient information system), the campaign should be reconsidered and perhaps even eliminated [4].

The State of Sao Paulo has opted for the maintenance and improvement of the program by correcting, among other problems, those items indicated by some authors [4] and our group demonstrated, in recent studies, that the Sao Paulo's campaign has corrected some errors of 2007 [14,15]. And in front of the progress and challenges there was a timely reassessment of the program in 2010, bearing in mind that Sao Paulo's government screening for oral cancer policy is necessary to know the trends and analyze them from the perspective of net service organization.

Figure 1 clearly illustrates the increase of cities in the early years of the campaign and, more recently, the stability of the process. This shows that cities have joined the program voluntarily and that there were no signs of neglect and/or decrease in this number in succeeding years. The stability provided by this variable, seen in Table 3, gives a good indicative for the State to plan for future programs based on the number of partner municipalities, in order to define a reference for histopathological diagnosis and oral cancer treatment. Moreover, it provides specific resources, as more than 300,000 oral examinations were performed per year between 2001 and 2009.

Each year, more patients vaccinated against the influenza virus are also examined and screened in the oral cancer campaign (Table 2). The screening coverage rate showed an increasing trend. This may be an indication that the program has achieved compliance by the municipalities, which have organized, trained and made available their dentists, and motivated their teams to perform increasingly efficient oral health exams.

Considering that the literature points out that more than 41% of general dental practitioners described their undergraduate training to recognize oral cancer as insufficient [16], training and qualifying those dentists becomes an important tool to improve efficiency of oral cancer early detection.

Studies published in 2008, even though the target was not oral cancer, referred to the importance of tracking the elderly population in relation to degenerative diseases and/or those related to smoking habits [17]. The World Health Organization (WHO) recommends that certain countries should adopt strategies for improving the oral health of the elderly, and oral cancer is included in these recommendations [18].

The effectiveness of early detection in reducing the prevalence of oral cancer is controversial. A systematic review of the cost-effectiveness and applicability of screening failed to find sufficient evidence "to determine public health relevance in controlling morbidity, mortality, or quality of life"

[19]. However, a recent study suggests that visual inspection of the mouth could reduce mortality from oral cancer [20].

Some aspects could be included in the analysis of the screenings of oral cancer in the elderly. For users of public health systems, regardless of country or region, the screening could be important opportunity for the oral health team to have contact with the elderly population, since these individuals often consider it unnecessary to have regular appointments with their dentists after they become completely edentulous. The literature indicates that there is a delay of about 90 days between the first symptoms noticed by the patient and the first consultation with a physician or dentist for an oral mucosal evaluation [21]. This fact bears a decisive impact on the prognosis of these patients, since performing screenings among an asymptomatic population may be also important and relevant to their outcomes.

For the patients referred for CEO's specialists (secondary care level), as well as the screening coverage, the trend was increasing (table 3). The results of these numbers is crucial for the net service organizations since it involves, beyond the clinical diagnosis, the histopathological examination. Therefore, the centres for medium complexity, which were only created in 2004 in Brazil, should be prepared every year for a growing demand from this kind of patients referred. The literature clearly shows that fast-track referrals for those suspected with cancer may diminish greatly the length of the diagnostic delay⁸, and that the Brazilian health system may have reached an important quality leap in their oral health system when the structured CEOs were made viable and established [22,23].

Other important data pointing to the evolution of the campaign were the declining trend in the percentage of new cases of soft tissue lesions (Figure 4) and the decreasing incidence of oral cancer (Table 1). In the earlier period of the campaign it was observed a yearly increase of benign and malignant lesions incidence. This could be explained by the repressed demand until that historical moment, considering that neither the elderly nor any other adults were covered by oral health care programs in Brazil [24]. Until that time, these programs were exclusively for maternal and child care.

With the further networks structuration for oral benign lesions treatment (CEOs), and the incorporation of local experts in stomatology and maxillofacial surgeons by the public service, patients were treated for their lesions. As a result, when re-evaluated in subsequent years, patients no longer exhibited those benign pathologies. Therefore, although the absolute number of referrals of suspicious oral cancer presented an upward trend (Table 3), the relationship between referred and examined patients (percentage of referrals) decreased. This apparent discrepancy may be explained by the increasing screening coverage and the inclusion of new patients screened every year.

Moreover, comparing data from 2005 to 2009 shows a reduction from 20.9 to 11.1 per 100,000 in the rate of confirmed oral cancer cases (Table 1). This period coincides with the implementation of the national policy on oral health, the early structuration of the secondary oral health care⁵, and more direct dialogue with tertiary care (Oncology Care Centres, or CACONs)

[25]. These late are responsible for handling the cases of oral cancer detected by dentists in the secondary network [8].

The increasing number of initial lesions detected could be explained by the lack of access of the population to public dental services; or, it may be indicative of the lack of a resolution of the secondary and the tertiary care until 2004/2005, when a more clearly and defined network to refer of patients was structured [4].

It is worth emphasizing the importance of specialized dental clinics - CEOs, which allowed an increase in the availability of skilled professionals in the field of oral diagnosis at a time when the campaign extended the screening.

Apparently, the saturation of the sample and the implementation of a national oral health policy, with more efficient secondary oral health care and greater involvement of tertiary services for oncology care, may explain the gradual decrease of suspected cases and new cases of oral cancer in the screened population.

The model for oral cancer tracking in the state of Sao Paulo has shown to be, if well-articulated with all government spheres and all levels of health care, an efficient model for prevention and early detection of oral cancer, as suggested in the literature [26] Also, the presented strategy seemed to provide a unique opportunity to incorporate oral cancer into the public health agenda, acting as a transforming factor for the organization of public health institutions in São Paulo, Brazil.

Conclusion

In summary, it is possible that oral cancer screenings were more important for oral health services improvement than to the diagnosis of oral cancer itself. However, the trend of voluntary participation of cities in oral cancer campaign remained stable, the number of people examined during the screening coverage and the absolute number of network referred to secondary oral health care showed an increasing trend. The percentage of suspicious cases of oral cancer showed a decreasing trend, as though the number of confirmed cases. Our results suggested that moments such as campaign were capable to stimulate and to organize the network of patient care, encouraging dentists to implement oral cancer early diagnosis, and offering effective contact with the elderly population.

References

1. Instituto Nacional de Câncer José Alencar Gomes da Silva, Coordenação de Prevenção e Vigilância. Estimativa 2014: incidência de câncer no Brasil Rio de Janeiro: INCA; 2014.
2. Sankaranarayanan R, Ramadas K, Thomas G, Muwonge R, Thara S, Mathew B, et al. Effect of screening on oral cancer mortality in Kerala, India: a cluster-randomized controlled trial. *Lancet* 2005; 365(9475):1927-33.
3. U.S. Preventive Services Task Force. Screening for Oral Cancer: U.S. Preventive Services Task Force Recommendation Statement. [Access 27 Jul 2014]. Available from: www.uspreventiveservicestaskforce.org/uspstf/uspsoal.htm.

4. Antunes JLF, Toporcov TN, Wünsch-Filho V. The effectiveness of the oral cancer prevention and early diagnosis program in Sao Paulo, Brazil. *Rev Panam Salud Publica* 2007; 21(1):30-6. doi: 10.1590/S1020-49892007000100004.
5. Brasil. Ministério da Saúde. Departamento de Atenção Básica. Coordenação Nacional de Saúde Bucal. Diretrizes Nacionais de Saúde Bucal. Brasília; 2004 [Access Jan 2011]. Available from: http://conselho.saude.gov.br/web_comissoes/cisb/doc/politica_nacional.pdf.
6. Pucca Jr GA, Costa JFR, Chagas LD, Silvestre RM. Oral health policies in Brazil. *Braz Oral Res* 2009; 23(Suppl 1):9-16. doi: 10.1590/S1806-83242009000500003.
7. Pucca Jr GA. A política nacional de saúde bucal como demanda social. *Cien Saude Colet* 2006; 11(1):243-6.
8. Gómez I, Warnakulasuriya S, Varela-Centelles PI, López-Jornet P, Suárez-Cunqueiro M, Diz-Dios P, SeoaneGómez J. Is early diagnosis of oral cancer a feasible objective? Who is to blame for diagnostic delay? *Oral Dis* 2010; 16(4):333-42. doi: 10.1111/j.1601-0825.2009.01642.x.
9. Passos MRL, Arze WNC, Mauricio C, Barreto NA, Varela RQ, Cavalcanti SMB, et al. Is there increase of std during carnival? Time series of diagnoses in a STD clinic. *Rev Assoc Med Bras* 2010; 56(4):420-7. doi: 10.1590/S0104-42302010000400014.
10. Antunes JLF, Waldman EA. Trends and spatial distribution of deaths of children aged 12-60 months in São Paulo, Brazil, 1980-98. *Bull World Health Org* 2002; 80(5):391-8.
11. Gaynor PE, Kilpatrick RC. Introduction to time-series modeling and forecasting in business and economics. New York: McGraw-Hill; 1994.
12. Biazevic MGH, Castellanos RAA, Antunes, JL Ferreira, Michel-Crosato E. Trends in oral cancer mortality in the city of São Paulo, Brazil, 1980-2002. *Cad Saúde Pública* 2006; 22(10):2105-14. doi: 10.1590/S0102-311X2006001000016.
13. Forleo-Neto E, Halker E, Santos VJ, Paiva TM, Toniolo-Neto J. Influenza. *Rev Soc Bras Med Trop* 2003; 36(2):267-74.
14. Martins JS, Abreu SCC, Araújo ME, Bourget MMM, Campos FL, Grigoletto MV et al. Strategies and results of the oral cancer prevention campaign among the elderly in São Paulo, Brazil, 2001 to 2009. *Rev Panam Salud Publica* 2012; 31(3):246-52. doi: 10.1590/S1020-49892012000300010.
15. Almeida FCS, Cazal C, Pucca JGA, Silva DP, Frias AC, Araújo ME. Reorganization of secondary and tertiary health care levels: impact on the outcomes of oral cancer screening in the São Paulo State, Brazil. *Braz Dent J* 2012; 23(3):241-5. doi: 10.1590/S010364402012000300010.
16. Kujan O, Duxbury AJ, Glennly AM, Thakker NS, Sloan P. Opinions and attitudes of the UK's GPs and specialists in oral surgery, oral medicine and surgical dentistry on oral cancer screening. *Oral Dis* 2006; 12(2):194-9. Doi: 10.1111/j.1601-0825.2005.01188.x.
17. Spalding MC, Sebesta SC. Geriatric screening and preventive care. *Am Fam Physician* 2008; 78(2):206-15.
18. Petersen PE, Yamamoto T. Improving the oral health of older people: the approach of the WHO Global Oral Health Programme. *Community Dent Oral Epidemiol* 2005; 33(2):81-92. doi: 10.1111/j.1600-0528.2004.00219.x.
19. Truman BI, Gooch BF, Sulemana I, Gift HC, Horowitz AM, Evans CA, et al. Review of evidence on interventions to prevent dental caries, oral and pharyngeal cancers, and sports-related craniofacial injuries. *Am J Prev Med* 2002; 23(1S):21-54. doi: 10.1016/S0749-3797(02)00449-X.
20. Sankaranarayanan R, Mathew B, Jacob BJ, Thomas G, Somanathan T, Pisanti P, et al. Early findings from a community-based, cluster-randomized, controlled oral cancer screening trial in Kerala, India. *Cancer* 2000; 88(3):664-73.
21. Scott SE, Grunfeld EA, McGurk M. Idiosyncratic relationship between diagnostic delay and stage of oral squamous cell carcinoma. *Oral Oncol* 2005; 41(4):396-403. doi: 10.1016/j.oraloncology.2004.10.010.
22. Pucca Junior GA, Lucena EHG, Cawahisa PT. Financing national policy on oral health in Brazil in the context of the Unified Health System. *Braz Oral Res* 2010; 24 Spec Iss 1:26-32. doi: 10.1590/S1806-83242010000500005.
23. Pedrazzi V, Dias KRHC, Rode SM. Oral health in Brazil - Part II: Dental Specialty Centers (CEOs). *Braz Oral Res* 22 (Suppl 1):18-23. doi: 10.1590/S1806-83242008000500004.
24. Pucca Jr GA, Gabriel M, Araujo ME, Almeida FCS. Ten years of a National Oral Health Policy in Brazil: innovation, boldness, and numerous challenges. *J Dent Res* 2015; 94(10):1333-7. doi: 10.1177/0022034515599979.

25. São Paulo. Secretaria de Saúde de São Paulo, Fundação Oncocentro. Relatórios da campanha de prevenção de câncer de boca - 2005/2008. São Paulo; 2008. [Access Apr 2010]. Available from: <http://www.fosp.saude.sp.gov.br/>.
26. Hobdell M, Petersen PE, Clarkson J, Johnson N. Global goals for oral health 2020. Int Dent J 2003; 53(5):285-8.